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Expanding The Horizons Of Communications

Space Communicator

GSFC Space Communications Program - Code 450

Inside This Issue:

Human Space Flight Activities and Return to Flight

The Space Shuttle Program continues to work towards a May 15, 2005 launch date. Goddard Human Space Flight (HSF) Return To Flight (RTF) activities are seeing accelerated activity as several RTF projects are nearing completion. We are continuing to test and train as we work towards revalidating the Integrated Network for RTF.

Five members of the STS-114 crew visited the GN station at MILA on December 13, 2004. Shuttle Commander Eileen Collins, Pilot Jim 'Vegas' Kelly, and Mission Specialists Wendy Lawrence, Steve Robinson, and Andrew Thomas spent approximately 2 hours with Station management and personnel. Outgoing Station Director Tony Ippolito and incoming Station Director Gary Morse briefed the crew on the station capabilities and provided a short tour of the site. The crew then posed for pictures with the station personnel, shared refreshments, and visited in a casual and relaxed atmosphere. Everyone really enjoyed visiting with the crew, and I think we all drew tremendous inspiration from them. I believe we all came away from this visit with a renewed sense of dedication, responsibility, and pride for the role we will play when these brave Astronauts climb aboard the Shuttle Discovery and return to flight.

STS-114 Crew and MILA Station Personnel

continued on page 10

A newsletter published by the Space Communications Program Office of NASA Goddard Space Flight Center

A Message from the Associate Director / Program Manager for Space Communications

We enter the new year fresh from our holiday reverie, recharged by the unique opportunities and challenges that new projects and missions bring and sobered by the loss of some of our friends that have meant so much to each of us over the many years and through many projects. Triumph and tragedy are ever with us and remind us of our humanity and that which separates us from the rest of the animal kingdom.

It was with great sadness that we note the passing of two long time members of the SCP family: Paul Heffernan Systems Manager of the TDRS Project; and Bob Traversy of the SN WSC. Paul provided over 40 years of service to NASA as a communications engineer contributing greatly towards space communications and the exploration of space. Bob Traversy, or "Trav" to his coworkers, served his company and customer in an admirable way as a key leader of the SN M&O contractor team since the beginning of the TDRS System. I ask you to join me in celebrating their memory and many contributions to NASA, GSFC and the Nation.

I am also pleased to note that the generosity of the SCP family has been extended to supporting our troops in Iraq. Over 40 boxes full of donations from SCP employees have been sent overseas to Marine and Army service men and women. My thanks to our Program Secretary, Joan Walton, who initiated the effort and continues to provide the leadership to ensure its success. Further information on this support effort is contained within this newsletter.

The tragedy of the Indian Ocean earthquake and the resultant Tsunami provided us with a unique opportunity to adapt NASA technology and satellite communications capability for the benefit of our fellow citizens of the earth through an early warning proposal called the Global Instantaneous Alert Network via TDRSS (GIANT). This proposed system leverages our demand access communications capabilities to assist in the saving of lives in the Indian Ocean region. It was proposed to NASA HQ as part of NASA's response to the US Government's contribution to reduce loss of life and human suffering from similar future events.

GSFC 'Return to Flight' activities continue toward the successful launch of the Shuttle in mid-May. Scheduled throughout the next month is the completion and final test of the White Sands Space Harbor UHF system, External Tank Television improvements at MILA/PDL, Wallops, and Jonathan Dickinson Missile Tracking Annex (Fl.) and Guam Shuttle Television capability. The HSF team continues to prepare for the May 15th launch date including conducting many tests, a long duration simulation and training exercises with the Shuttle Training Aircraft. A thorough set of readiness reviews are also being conducted to ensure the highest possible confidence for successful mission support.

The "One NASA" policy has opened up exciting opportunities for the SCP to partner with other centers and organizations. We are developing an opportunity to work with JPL and GRC on lunar communications capabilities for the new Exploration Missions including a proposed Near Earth Array Network and the potential for a Communications and Navigation relay satellite network around the moon. Our involvement with the Exploration missions, and the Project Constellation Integrated Teams in particular, has increased substantially; however, more of our expertise is necessary to successfully accomplish the objectives of the teams. Our partnership with MIT and JPL on the MARS Laser Communications Demonstration (MLCD) continues to strengthen, having recently completed the first part of the PDR.

The last few months have been a busy time for the SCP. We bid a reluctant farewell to Dennis VanderTuig who, after 24 years, leaves SCP to take the reins at IFMP. We also say farewell and thank you to Rick Fitzgerald, the Project Manager for the MLCD Project and acknowledge his hard work and contributions. Rick is leaving to join private industry. Bob Jenkens, who was the TDRS Project Manager, has been named to take over the reins at MLCD. Ed Lowe has been appointed as Acting Project Manager for TDRS. We welcome Gary Morse back in support of the SCP. The "One NASA" policy has enabled Gary to spend over half of his time as MILA Station Director while a KSC employee.

While we continue at a fever's pitch working to meet our customers needs we see unprecedented opportunities to contribute to the future of NASA and the Nation. To continue to be leaders in our field we must boldly move forward to develop these opportunities. Together we can create the future in Space Communications!

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Inside the Space Communicator

Space Communications Program

SCP Providing Comfort and Support to Marines in Iraq

The SCP family supported 38 Marines (Operation Flying Tigers) from the Marine Heavy Helicopter Squadron #361 based at Marine Corps Air Station in Miramar, California. Bob and Joan Walton (Code 450) put this support in motion last summer after returning from a reunion of Bob's Flying Tigers squadron from Vietnam. Those Vietnam era vets voted to support young Marines of the 361 while they are deployed and serving in Iraq. When the SCP family learned of this effort, many wanted to jump in and lend their support too, and a successful mission was born.

Forty-four boxes were sent to Iraq, along with donations for our Marine families at Christmas. In fact, all of our Marines received personal boxes from SCP at Christmas. Packages were variously loaded with toiletries, snacks, magazines, cards, phone cards and letters aimed at making their tours more comfortable. We continued to send boxes to our Marines until they rotated home. Our Marines arrived in Iraq last August and returned home in February 2005. We were saddened by the loss of four Marines from the HMH-361 squadron in a helicopter crash in January.

One of the four Marines, Capt. Lyle Gordon, 30, of Midlothian, TX, was one of the Marines that we sponsored. The other Marine, Capt Paul Alaniz, 32, of Corpus Christi, TX, attended the Helicopter Reunion in Reno, NV in July,which Joan and Bob Walton attended. They had the honor of meeting him along with other crew members.

This comfort and morale activity has been such a great success that the SCP family has decided to continue this type of support to family members of SCP personnel who are serving overseas. With the help of the SCP family, we will continue to work for a continuing successful mission.

Bob and Joan in front of a Squadron 361 Marine Heavy Helicopter

By Joan Walton
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Creative Venues Enhance Program Wide Outreach Activities

Space Communications Program (SCP) personnel have had another busy season of reaching out to interested observers. In August, the SCP converted its summer intern, Sophia Qian, to GSFC Co-op status. Sophia attends classes at Gallaudet University in Washington D.C. Phil Liebrecht continues to serve on an external advisory board at Prince Georges Community College for a program to increase minority student success in math, science and engineering. The SCP's Near Earth Networks Services (NENS) Contract has signed a Memorandum of Understanding with Capitol College in Laurel, MD to bring students on board NENS. This MOU provides the contract with access to additional schools and students through a regional consortium established by Capitol College. The NENS contract has already hired 3 interns from New Mexico State University who are on-site at the White Sands Complex. SCP also has another initiative with Capitol College that allows for a co-op student to support Dave Israel in the SCDS Technology area. We continue to explore other opportunities to provide meaningful development activities for students.

Speaking opportunities at local schools abound. In October, Phil Liebrecht spoke to five classes of ninth graders at Blake High School in Montgomery County as part of the Achievement Counts Program. He also taught a module on Space Comm and Space Operations at the Technical Managers Training at Wallops. Bob Jenkens, TDRS Project Manager, participated in a December career day at an elementary school in Calvert County, MD. He gave highlights of a career in Aerospace Engineering to three classes of fourth and fifth graders, and stimulated their interest when he showed a short video of the TDRS-I launch. The TDRS Project will also support the Hope Chapel Academy's Beach Bot Ball Team at Hermosa Beach, CA during the FY2005 FIRST Robotics Competitions. FIRST (For Inspiration and Recognition of Science and Technology) is an annual multi-national competition in which teams design, assemble, and test their robots, and enter local and national competitions. This competition is a very positive way to get today's students to learn about and become interested in the basic technological fields.

FIRST Robotics Competition

Another unique way to reach out and enhance learning opportunities is being developed by the Space Network (SN) Project. SN is working co-operatively with the Shuttle Small Payloads Project Office and coordinating with the Goddard Education Office, to develop the components of the Space Operations Learning Center. SN is underwriting and providing technical expertise to developers of the Space Operations Learning Center web portal in an effort to promote and inspire future engineers and explorers through exposure to space operations, exploration and technologies.

Finally, our SCP-sponsored Emeritus activities are just beginning to heat up. Bob Stanley judged 22 chemistry exhibits at the Fairfield High School Science Fair in Fairfield, PA in January. And Hugh O'Donnell, also in January, helped review the Science Fair student proposals for St. Joseph's School in Beltsville, MD. We look forward to hearing more about their science judging activities in our next edition of the *Space Communicator*.

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Space Communications and Data Systems Technology Program Update

The GSFC Space Communications and Data Systems (SCDS) Technology Program provides state-of-the-art technologies that will enhance or enable the Space Communications Program (Code 450) customer services and capabilities. The goals of the SCDS Technology Program are to:

- Provide mission-enabling spacecraft guidance, navigation, and control capabilities;
- Improve space communications spectrum efficiency;
- Lower the cost of mission networking operations;
- Make launch and range services more economical; and
- Provide enhanced technologies for the Space Network (SN).

Several new tasks have been added to the SCDS Technology Program within the last year to support the goal of enhanced SN technologies. These tasks are described below.

a. Advanced S-band Multiple Access (MA) Antenna Element *(Principal Investigator [PI]: Armen Caroglanian, Microwave and Communication Systems Branch, Code 567)*

The purpose of this task is to facilitate the technical exchange between the GSFC Tracking and Data Relay Satellite (TDRS) Project, Glenn Research Center, and Ames Research Center in the development of candidate enhanced MA antenna elements. The overall objective is to develop enhanced antenna elements which, when placed in an array, will provide an MA service having performance similar to the current Single Access (SA) service.

b. Rigid Tri-band SA Antenna (PI: Armen Caroglanian, Code 567)

The TDRS SA low-efficiency antenna requires use of a deployable reflector antenna. The development of a rigid high-efficiency antenna would eliminate the risk associated with a deployable reflector. The objective of this task is to investigate Radio Frequency (RF) feed and technologies for constructing a Rigid Tri-band SA antenna, with the goal of exceeding 60% efficiency across all TDRS System (TDRSS)-user bands from 2 to 27.5 GHz.

c. High Performance Diplexer and Filters *(PI: Yi Ngan, Code 567)*

The purpose of this task is to investigate the feasibility of applying state-of-the-art commercial Personal Communications System (PCS) base-stations and mobile hardware technologies in the next generation TDRS RF front-end design. The overall objective is to develop a high performance diplexer/filter with low insertion loss, high power handling capability, sharp roll-off frequency response, low weight, and small volume. The high performance diplexer/filter will enable the implementation of an enhanced MA service.

d. MA/S-band Single Access (SSA) True Time Combiner *(PI: Yi Ngan, Code 567)*

The next generation TDRSs will offer enhanced services based on the ability to combine signals from widely separated antennas over a large field of view. The objective of this task is to design a flight component that coherently combines the return signals from the SSA antenna and an on-board MA formed beam from a user over a wide field of view and over the SSA Return (SSAR) frequency band.

e. High Speed Multi-Function Digital Baseband Modulator/Demodulator *(PI: Wai Fong, Code 567)*

This task provides digital modulation technology needed for most future NASA missions. The objective is to design, fabricate, and test a high speed (>300 Mbps) multi-function digital modulator/demodulator circuit to provide selectable functions of Offset Quadrature Phase Shift Keying (OQPSK), Gaussian Minimum Shift Keying (GMSK), and Four Dimensional (4D) Trellis Coded Modulation - Eight-Phase Shift Keying (TCM-8PSK). The TCM-8PSK will also provide more than 5-dB coding gain over uncoded 8PSK.

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NASA and International Technical Data Systems Standards Development

GSFC personnel routinely lend their special expertise in technical data systems standards development, via participation in and cooperation with the NASA Technical Standards Program (http://standards.nasa.gov/) and Consultative Committee for Space Data Systems (CCSDS) (http://www.ccsds.org/).

The overall NASA Data Systems Standards Program is led by Dr. John Kelley, Program Executive in NASA HQ's Space Operations Mission Directorate. The GSFC Technical Standards Organization (http://standards.gsfc.nasa.gov), a function of the Applied Engineering and Technology Directorate (AETD), Code 500, is lead by Dr. George Alcorn. It is organized into three high-level categories:

- Data Standards
- Engineering Standards
- Workmanship Standards

GSFC data systems standards recommendations are directed by the Data Systems Standards Manager (DSSM), functionally assigned to Code 450. Ms. Madeline J. Butler (Code 500) leads this activity. In this capacity, Ms. Butler is responsible for coordination of data systems standards for all GSFC organizations. High-level recommendations have been prepared for:

- Next Generation Space Internet
- Space Link Extension
- Lossless Data Compression
- eXtensible Markup Language (XML)
- Onboard Interfaces
- Reference Model for Open Archival Information Systems
- Navigation Data Messages

The DSSM will host the *GSFC Data Systems Standards Annual Independent Review and Assessment* on March 17, 2005 at GSFC. The review board, composed of independent technical authorities, will review current, on-going activities and recommend future courses of action. Ms. Butler's team is comprised of experts in various data systems standards disciplines, who will status activity in the following areas:

- Space Link Protocols for High-rate and Proximity Missions (*Tim Ray/Code 584*)
- Reliable File Delivery Protocols and Relay Operations *(Tim Ray/Code 584)*
- Data Compression for High-rate Missions (Pen-Shu Yeh/Code 567)
- Bandwidth and Power Efficient Modulation and Coding *(Wai Fong/Code 567)*
- Space Link Service Request and Data Delivery Service *(David Israel/Code 567)*
- Cislunar Inter-networking *(David Israel/Code 567)*
- Spacecraft Onboard Interface Services *(Rick Schnurr/Code 560)*
- Archive Data Ingest *(Don Sawyer/Code 690)*
- Data Packaging and Registries *(Lou Reich/Code 690 [CSC])*
- Navigation Data Exchange Standards *(Felipe Flores-Amaya/Code 595)*
- Spacecraft Monitoring and Control *(Don Lokerson/Code 599)*
- Space System Security *(Clayton Sigman/Code 585)*

For further information about GSFC data systems standards activities, contact Ms. Butler at 301-286-4806 (e-mail: Madeline.J.Butler@nasa.gov). (Watch this space in future issues of the *Space Communicator* for regular updates.)

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451

Customer Commitment Office

CCO Supports Reimbursable Missions

The Customer Commitment Office supports reimbursable missions. There are two types of support for reimbursable missions. The first type of support is to provide communications for the Expendable Launch Vehicle (ELV), usually via the Tracking and Data Relay Satellite System (TDRSS) and ground stations. The second type of support is to provide communications to the payload or satellite. The overwhelming majority of the customers in any given year require ELV support. Atlas, Sea Launch, P-3, and the DoD are routine customers. Occasionally, Orbital Sciences, the Japan Aerospace Exploration Ageny (JAXA), and the European Space Agency (ESA) will request support. The reimbursable support is governed by the Commercial Space Launch Act, which provides for assistance to commercial customers where there is clearly no commercial entity that could provide the support.

The Customer Commitment Office ELV team supports approximately 17 to 26 launches per year. Virtually every month there is a launch being supported. Approximately 75 percent of the supports in a given year are for non-NASA missions. Reimbursable missions bring in approximately a million dollars a year. Of course, there is no profit; the reimbursements are only for the cost of the support. The ELV team is composed of experts who provide communications support to an expendable launch vehicle. A small but efficient team, consisting of the Mission Commitment Manager, Flight Dynamics Engineer, Network Operations Manager, NISN Communications Manager, Radio Frequency Engineer, Ground Network Engineer, and a Space Network Engineer, staffs reimbursable launch support. Successful launch supports are a result of many hours of testing, analysis, coordination, reliable circuits, defining and clarifying requirements, reviews, and a lean team of dedicated experts united in the endeavor to provide communications support to ELV customers. The ELV team has an average cycle time of 6 to 9 months from when the requirements come in to the day of launch support. This is a fast-paced operation given that there are new customers coming in every month.

OSC's Pegasus XL - ELV

While supporting the commercial launch of Sea Launch/Telestar, there was an anomaly caused by the commercial rocket. The ELV team worked diligently to provide communications coverage to the rocket given the non-nominal conditions. The team's procedures worked well, the communication among the team was clear and direct, and the team's preparation and subsequent actions proved worthy. Each member of the ELV team performed outstandingly. The data provided to the customer was instrumental in tracking the payload after separation.

continued on page 9

Reimbursable Missions (from page 8)

Boeing's Delta II - ELV

The men and women that make up the ELV team work well together. The team has, on several occasions, identified improvements and taken action to implement them. The ELV team is good at accepting responsibility and taking action to maintain a high level of readiness. Reflecting upon the successful supports in 2003 and 2004, plus missions supported thus far in 2005, we can be proud of the members of the ELV team that performed their job well.

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Space Communications Customer Forum

The Tenth Space Communications Customer Forum (SCCF #10) was held on December 9, 2004, in GSFC's Building 3 Goett Auditorium. This triannual event is sponsored by the Customer Commitment Office (CCO), Code 451, and hosted by Mr. Al Levine, the CCO's Service Planning Manager.

Mr. Roger Flaherty, Deputy Program Manager for the Space Communications Program (Code 450), provided the opening remarks, discussing many of the SCP's highlights from 2004, as well as ongoing initiatives in which the SCP is involved. These include the Swift launch, implementation of the Mars Laser Communications Demonstration (MLCD) Project (Code 455), the proposed Space Network Expansion (SNE) Project (proposed to be Code 456), TDRSS Continuation activities, preparations for Human Space Flight (HSF) Return to Flight, and participation in Architectural studies and initiatives at the NASA HQ agency level.

Featured topics included overviews of the new MOMS and NENS contracts as well as program highlights. Prominent within both efforts was the successful transition of both contracts from the predecessor (Consolidated Space Operations Contract) and continuing successful support of the flight projects and Networks.

Next on the agenda were the status updates from both the customer (i.e., flight projects) and service provider sides. HSF status included Space Shuttle Return to Flight accomplishments and upcoming activities (planned launch in mid-May 2005), and International Space Station (ISS) status and plans. Space Science status updates were also presented. Swift's experience with the new Demand Access Service (DAS) was featured: the success, the problems encountered, and current efforts to improve the service.

On the service provider side, status updates were provided by the NASA Integrated Services Network (NISN), Flight Dynamics Facility (FDF), Space Network (SN), and Ground Network (GN). NISN initiatives addressed included the Norway Fiber Initiative, the Mission Operations Voice Enhancement (MOVE) Project, and the NSAP Technology Refresh (NTR). The FDF status presentation indicated numerous new mission and launch supports, as well as planned system upgrades and improvements. GN status included a summary of the results of the Ground Network Independent Assessment. The near-term plans for the TDRS constellation were emphasized in the SN status update.

Mr. Levine presented a Space Network and Ground Network loading overview and near-term (through CY2006) service level expectations.

Overall, the forum was a full program. Anyone interested in viewing the presentations provided in this meeting or any past forums may access them online at http://scp.gsfc.nasa.gov/sccf/.

The most recent SCCF was held on March 17, 2005. Further information will be provided and may also be found at the above WWW location.

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Return To Flight (from cover page)

Ground Network (GN) External Tank Television (ETTV) requirements at Merritt Island (MILA), Ponce de Leon (PDL), Wallops, and Jonathan Dickinson Missile Tracking Annex (JDMTA) continue on track. The NENS contractor personnel have completed integration of new recorders and ancillary hardware at MILA, PDL, and Wallops. Work at JDMTA is scheduled for completion in mid-March.

Significant progress is being made on the new White Sands Space Harbor (WSSH) UHF air-to-ground voice implementation. The T-1 circuits are nearing readiness, the tower has been erected, and all equipment racks, which were assembled at Goddard using mostly equipment from the old Bermuda Tracking Station, are on site and being installed. The pedestal and helix antenna were delivered and utilized during initial testing with the Shuttle Training Aircraft.

The SN station at Guam has received equipment to be implemented so that the Shuttle Thermal Protection System (TPS) Inspection TV can be downlinked to the site and routed along the new DS-3 links to WSC and on to JSC. This added capability will aid the program in downlinking the large amounts of TV expected in conjunction with the on orbit heat tile inspection.

The GSFC HSF team held an RTF Mid-Point Review on January 11, 2005. The purpose of the review was to look at the status of each element of the Integrated Network. Representatives of each element provided a briefing on their revalidation effort, discussed any changes since STS-107, discussed certification and training status, identified risk and plans for mitigation of those risks, and provided their mission support readiness status. Twenty-two action items were assigned to the team. The overall Review Board assessment was that the team is headed in the right direction; however, there are a number of significant milestones which need to reach completion prior to the final RTF Operational Readiness Review, currently scheduled for April 14, 2005.

The week of January 24 saw the Shuttle Training Aircraft (STA) return to KSC with our Portable Spacecraft Simulator (PSS) on board for another round of training flights around KSC. During these STA flights, personnel from the Goddard Compatibility Test Lab accompany the PSS, and emulate the RF of a shuttle in launch and landing configuration for MILA and PDL training. During approximately 20 flights per day, various configurations and anomalies were introduced into the systems at MILA and PDL for the benefit of training site personnel and re-validating site readiness for RTF. On Friday, January 28, the STA made its first ever flight to Wallops and flew some 20 patterns as the PSS personnel put the Wallops personnel through a series of anomalies for training.

On Monday January 31, Wallops personnel received a visit from Astronaut Jerry Ross (see accompanying photo on page 21). Astronaut Ross, a Shuttle veteran, currently shares the record for most Shuttle missions with 7, and holds the U.S. record for the most time walking in space, as he compiled over 58 hours in "the great outdoors". Jerry talked to the station personnel and thanked them for their past support and talked about how important their role is for RTF. Ross was given a tour of the control room, and visited with the Wallops crews. He posed for pictures and also submitted to an impromptu question and answer session. Mr. Ross and the Wallops crews enjoyed refreshments before Jerry had to say goodbye.

The HSF team continues to provide support to the International Space Station (ISS) crew as the Russian Progress 16 Launch and docking occurred on Christmas. This Progress provided critical food supplies to the ISS crew when food levels were found to be less than expected. The docking was successful.

The next Network Support Group (NSG) meeting will be held at the Regents Park Complex just outside the Johnson Space Center the week of March 28, 2005. Three days of Splinter meetings will culminate with the general NSG meeting on March 31. This NSG will focus on RTF issues and element readiness to support STS-114. Check out the Network Director Web Site at: http://scp.gsfc.nasa.gov/hsfnsg/ and click on NSG.

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TDRS 10 to Transition Operations

The TDRS F10 spacecraft began its transition to operations on February 1 with activation of its payload and the onset of testing and calibration activities. As this goes to press, all activities are progressing nominally. These activities concluded on March 3rd with F10 replacing F4 as TDRS-East.

Once F10 has completed approximately one week of operations as TDRS East, the swap out of TDRS Spare will commence. F6 (currently TDRS Spare [TDS]) will be moved from 47W to 174W to make room for F4, which will move from 41W to 46W. During this transition, there will be no TDRS Spare service for a period of 4 to 10 days. Code 451 has worked diligently with the SN customers to limit impacts during this time. In fact, the move schedule was adjusted to allow support for an Atlas launch support on March 10th.

TDRS 10 Illustration

continued on page 12

TDRS 10 (from page 11)

By the summertime, the TDRS constellation will be configured as represented in the table below:

275W		174W	171W		150W		62W		49W	46W	41W
F3		F6 (s) & F8	F5		F7 (s)		F9 (s)		F1	F4	F10

(s) - spare

However, the moves will not stop with the "east change out". Due to spacecraft anomalies and increasing inclination, the SN is currently planning to replace F3 with F7 at 275W (TDRS-Z). This move will likely occur in late 2005 or 2006, depending on the availability of ground antennas to support the move.

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4
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GSFC Orbital Information Group Transition

Since the Space Act of 1958 was enacted, NASA/GSFC has been responsible for providing orbital information in the form of two line elements to interested parties. These data, owned and transmitted by the United States Strategic Command, were distributed by the GSFC Orbital Information Group (OIG) via paper which was replaced approximately 12 years ago by a web site.

Several years ago, the Air Force expressed an interest in assuming responsibility for this function. On November 24, 2003, the President of the United States signed the Air Force Authorization Bill, giving the Air Force authority to proceed with a 3-year pilot program which would provide the same services as the OIG to Commercial and Foreign Entities (CFE). The effective date of the transition was expected no later than 180 days after the bill signing, thus making the new Air Force web site available on May 22, 2004.

In early 2004, a meeting was held in Colorado Springs, Colorado to begin the transfer process. Regular telecons were held between responsible parties from GSFC, the Air Force, and Aerospace Corporation, the contractor responsible for creating the new web site. Information transfer continued throughout 2004 and great progress was made. However, the deadline in May approached and was passed without implementation of the pilot program. Throughout the delays, both GSFC and the Air Force continued information transfer and assessment of the CFE web site.

All proper Air Force authorizations were obtained, and on January 3, 2005 the new Space Track web site was deemed operational. To date, the transition of operations has proceeded smoothly with only minor glitches, even with almost 3,000 registered users on the new Air Force web site. Like the OIG, the Space Track web site provides two line elements, satellite catalog messages, project messages, satellite decay messages, predicted decay forecasts, satellite box scores, and satellite reports.

This has been an extremely useful learning experience for GSFC and the Air Force participants, and GSFC stands ready to assist should any problems arise during the pilot period.

The new Air Force web site can be found at the following URL: http://www.space-track.org

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An Architecture for NASA Space Network IP Services

Abstract

The NASA Space Network (SN) supports a variety of missions using the Tracking and Data Relay Satellite System (TDRSS), which includes ground stations in White Sands, New Mexico and Guam. A Space Network IP Services (SNIS) architecture is being developed to support future users with requirements for end-to-end Internet Protocol (IP) communications. This architecture will support all IP protocols, including Mobile IP, over TDRSS Single Access, Multiple Access, and Demand Access Radio Frequency (RF) links. SNIS will be an operational service for data rates up to 7 Mbps. This paper will describe the SNIS architecture and present how some SN IP user operational scenarios will be supported.

Introduction

The NASA Space Network (SN) supports a variety of missions using the Tracking and Data Relay Satellite System (TDRSS), which includes ground stations in White Sands, New Mexico and Guam. The user data is transferred to and from the ground stations over the closed NASA network, known as the Internet Protocol (IP) Operational Network (IONet). Though the data streams on the IONet are all IP, the data streams to and from the user over the TDRSS Radio Frequency (RF) links are usually not. The SN has been providing IP service daily to the South Pole via the South Pole TDRSS Relay since 1997 [1]. Various IP experiments and demonstrations have been supported since, culminating with the Communications and Navigation Demonstration On Shuttle (CANDOS) experiment on board STS-107 in 2003 [2][3].

A new set of operational services, the Space Network IP Services (SNIS), is being added to the SN. These services will support users that desire end-to-end IP communications, in order to allow them to interact with their flight systems as IP nodes on the same network. The capabilities that were available on a limited and experimental basis previously, will become fully schedulable with the same availability and reliability as other SN services. Though the terms "flight systems" and "spacecraft" may be used throughout this paper, the SNIS system will work with any SN user's platform whether space-based, ground-based, or sub-orbital.

The use of end-to-end IP communications will enable operations concepts that are either currently cumbersome to implement or not possible. It is also anticipated that the use of commercial standards will reduce system development and integration and test costs, as well as provide flexibility for future requirements expansion.

End-to-End IP Communications

Currently the Space Network provides data interfaces between the user's control center and the ground station over the IONet. Though these interfaces use IP, either TCP/IP or UDP/IP, they do not provide an IP connection to the user's spacecraft. Any use of IP protocols for data transfer between the spacecraft and end user is not possible. As seen in the bottom two paths depicted in Figure 1, an SN user's data will currently be encapsulated in an IP packet by a gateway device at WSC and un-encapsulated by a device at the end user's location. These gateway devices require pre-pass configuration of data paths. Therefore, a user must know the source and destination of all spacecraft data a priori. If any distribution of telemetry data is required, it must first be routed to the pre-determined location (usually the Mission Operations Center [MOC]) and then distributed. For some science applications, the delay of passing data through a MOC first, though possibly on the order of half a second, may be undesirable.

In the case of the SNIS user, the IP packets either originate or terminate at the spacecraft. This makes the use of any IP protocol for data transfer between the spacecraft and end user possible. There is also no requirement for a priori knowledge of data sources or destinations, eliminating the need for pre-pass data path configurations. Telemetry can also be routed directly to a destination without being sent to a MOC first, thereby eliminating some data delivery latency.

Operational Concepts and Scenarios

Once a spacecraft is connected as a node or subnet on a network, many operational concepts and scenarios are either enabled or enhanced. This is due to the combination of data driven data distribution and the many commercially available IP-based protocols and applications. In this section of the

continued on page 14

Space Network IP (from page 13)

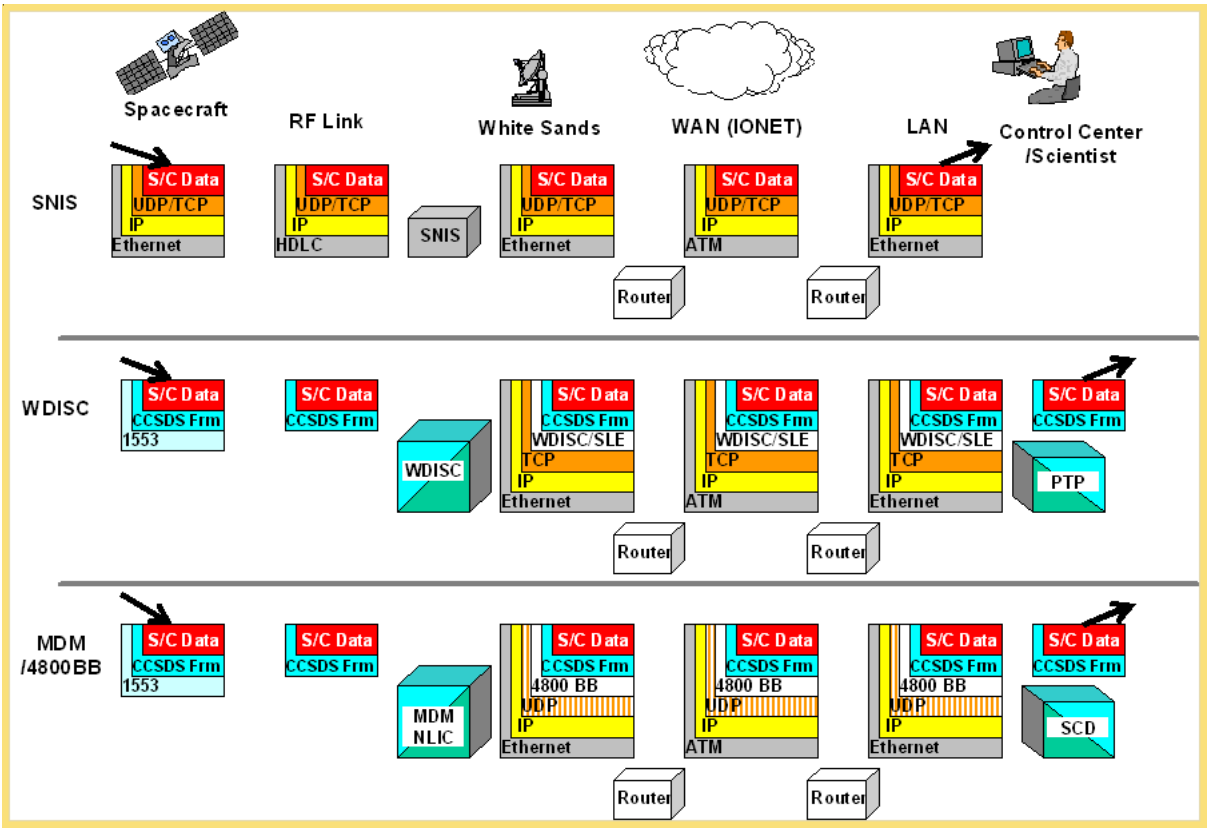

Figure 1 – WSC Low Rate Data Interface Comparison

paper several sample operational concepts will be described. A reference diagram that will be used in describing the ops concepts is presented in Figure 2. Both Spacecraft A and Spacecraft B are connected to the IONet by their RF links. Spacecraft A is using SNIS and Spacecraft B is using some other ground station. Both MOCs are also connected to the IONet.

Security

All spacecraft operations must be done in a secure manner. Even though operations will occur on the Closed NASA IONet, other safeguards will also be required. The use of end-to-end IP will make possible the use of Virtual Private Networking (VPN), IPsec, and other security solutions.

For example, MOC A may establish a VPN with Spacecraft A. The end points of a secure tunnel are the spacecraft and the MOC. The secure data packets will route through the IONet and the TDRSS links while still being protected. The advantage for the Space Network is that any end-to-end IP security solution, such as a VPN, will be completely transparent to the SN. Since security is a great concern to the Internet community at large, there will be constant developments of IP security solutions. SNIS will be in the position to take advantage of these developments as they occur.

Mobile Network Connectivity

SNIS will support the Mobile IP and Mobile Routing standards. These protocols will allow the data paths to the user spacecraft to be automatically configured at the start of a TDRSS event. Routers located at the White Sands Complex will act as Foreign Agents and transmit Mobile IP advertisements over the TDRSS Forward Link. The SNIS user will then be able to register its new connection to the network over the TDRSS Return Link and a Mobile IP tunnel will automatically be established between the spacecraft and its home agent. When a handover between TDRSS satellites or between TDRSS and a ground station occurs, the data paths will switch without the need for any manual reconfigurations at the stations or the MOC.

The Mobile IP tunnels are only required for the routing of forward link data. Any return link data will be routed as soon as the packets get to a router at White Sands, since they already have a valid destination address. Therefore, the common return link only support mode will automatically route data without pre-configuration or Mobile IP.

continued on page 15

Space Network IP (from page 14)

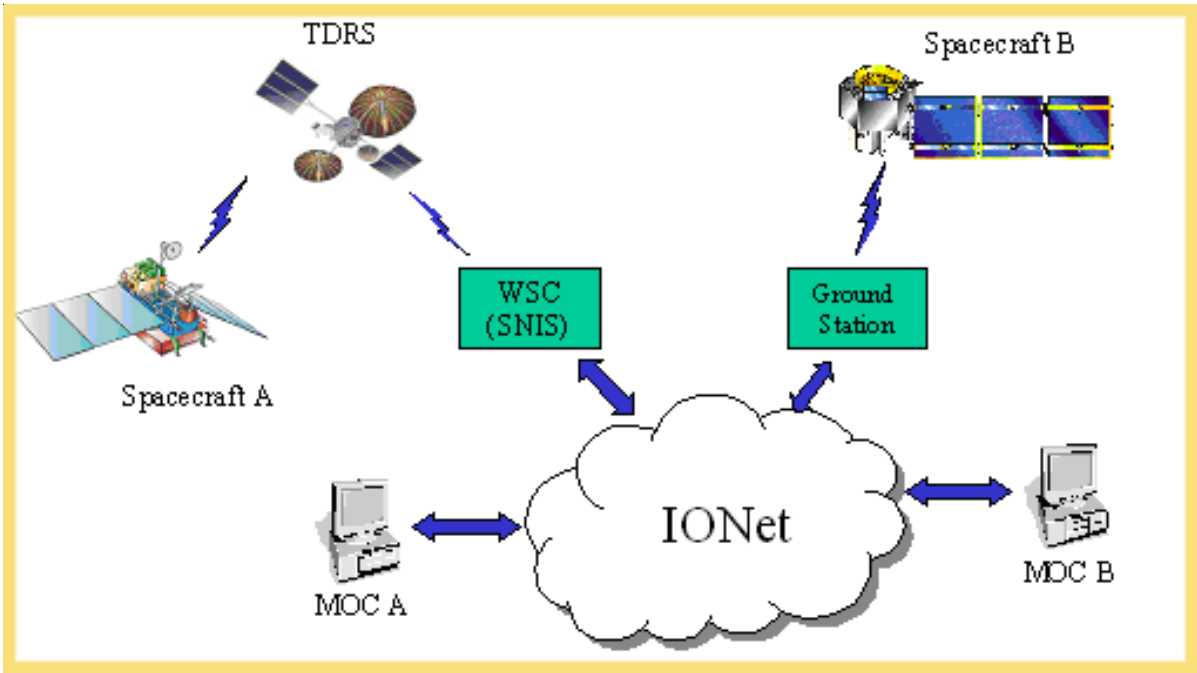

Figure 2 – SNIS Ops Concept Reference Diagram

Science Alert Notification

An increasingly common science mode of operations is the immediate notification of other instruments, telescopes, or facilities upon the detection of a specific event, such as a gamma-ray burst. The shortest delays possible in the distribution of the science alert is desirable for maximum science return. A SNIS user will be able to transmit an alert notification that will be routed directly from the ground station to the desired destination or destinations, if multicast is used. The combination of IP data routing and the TDRSS Demand Access System (DAS) Return Link will allow a spacecraft to send data to any destination on the network at anytime.

The example scenario would occur in the following manner: Spacecraft A detects a gamma-ray burst. The spacecraft transmits an alert packet over its DAS Return Link, which is always listening for transmissions from Spacecraft A. At the ground station in White Sands, the alert packet reaches a router after the return link signal has been demodulated and decoded. The router forwards the alert packet to the destination or destinations addressed in the packet's IP header.

Virtual Crosslinks

The destination address of an IP spacecraft's data packet can be another spacecraft or other platform. If it were two spacecraft, they could be on other sides of the planet, but still be communicating as if they had a crosslink. Both spacecraft would have to be connected to the network at the same time. For example, Spacecraft A could be a low Earth orbiting SNIS user and Spacecraft B could be a geosynchronous Earth science satellite with a continuous IP connection to a ground station. Spacecraft A and B are able to communicate by just addressing their IP packets to the other spacecraft's IP address. All of the data routing is then done without any pre-configuration, just as the Internet operates today.

Data File Delivery

A common operational requirement is the reliable delivery of files to and from a spacecraft. This is also a common requirement for Internet users, so there are many IP-based file transfer protocols available. There are protocols available using both UDP (such as CFDP, MDP, NORM) and TCP (such as FTP and SCP). If Spacecraft A were directly delivering files to MOC A or even Spacecraft B, the entire operation would be entirely transparent to the Space Network. The file packets would just be more IP packets flowing through the system.

The capability to provide Store and Forward file delivery service is also being considered for SNIS. This service would provide a server at White Sands that would temporarily hold user's files until they were forwarded to either the spacecraft, MOC, or other destination. This would provide a rate buffering service and also provide protection from terrestrial network errors.

continued on page 16

Space Network IP (from page 15)

Clock Correlation

Another requirement for all spacecraft is to maintain the accuracy of the onboard clock. There are standard network protocols for clock synchronization. These are the Network Time Protocol (NTP) and Precision Time Protocol (PTP). Network time service functions will be included in SNIS to allow the spacecraft to use the standard networking protocols to maintain their clocks. The achievable precision using this method is believed to be satisfactory for most users, but a future study to determine the achievable precision is planned.

Preliminary Architecture

In order to implement SNIS such that IP services can be provided at the same levels of reliability as other SN services, two fundamental types of interfaces must be made. The first set of interfaces is to commercial routers. The connections to and from the RF equipment at the White Sands Complex (WSC) must be made to appear as standard serial port interfaces to the routers. Once that is achieved all of the routing, Mobile IP, and other protocols that exist in a standard router will "magically" become possible over the TDRSS RF links. The second set of interfaces is to the WSC scheduling, monitor, and control systems. These interfaces will allow the SNIS users to schedule their services and monitor the performance through the same interfaces that are standard for all SN users. These interfaces to the WSC systems will also give the visibility for the automatic fail over capabilities required for the SN to maintain the high availability and reliability metrics.

As seen in Figure 3, SNIS is basically the addition of a new data path between the existing TDRSS low rate user data streams and the Closed IONet. SNIS is not intended to replace any of the existing data services. It will be a new alternative for future missions. The goals for the SNIS implementation are to maximize the use of commercially available hardware. The system should be modular and scalable in order to expand the capabilities and services as the user requirements increase and/or new IP technologies develop.

Summary

The SNIS development is underway. The Systems Requirements Review has been conducted, and 2006 is the year targeted for transition to full operations. The Global Precipitation Measurement Mission (GPM) is the first SN user with SNIS requirements. GPM is currently not scheduled for launch until 2011; however, it is anticipated that other SNIS missions will be in operations sooner. These missions may include Lunar Exploration missions, the Crew Exploration Vehicle, Earth Science unmanned aerial vehicles, and scientific balloons. Current updates about the status of the SNIS development can be found at http://snis.gsfc.nasa.gov.

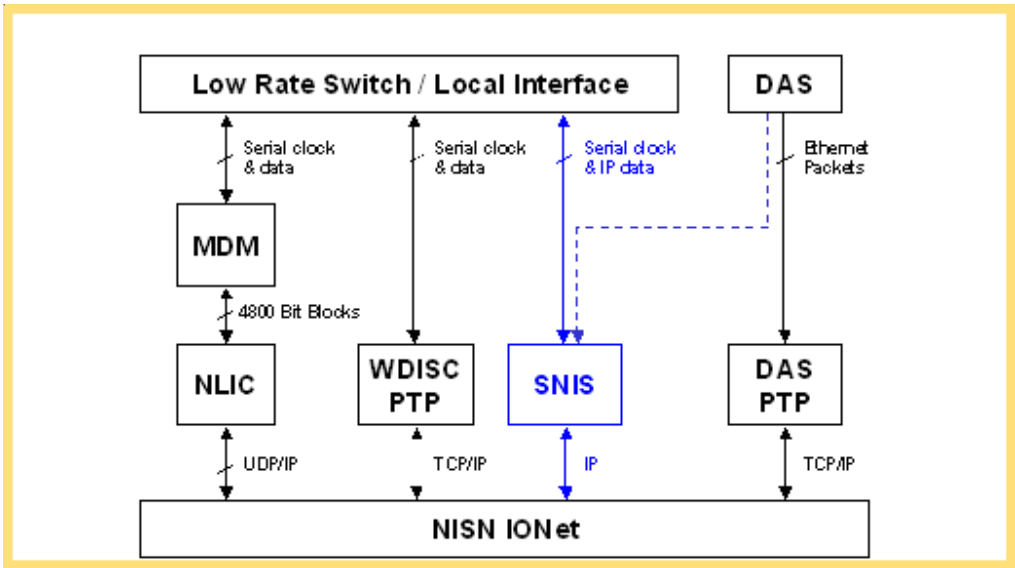

Figure 3 – WSC Low Rate Data Interfaces

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[2] D. Israel and D. Zillig, "CANDOS Experiment Overview," SpaceOps2002, Houston, Texas, October 2002.

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Ground Network Project
Code 453 NASA/GSFC

Ground Network Project

RTF at Wallops - A Day in the Life Event

Ground Network (GN) support to manned space flight is daunting. However, to the Near Earth Network Services (NENS) Return to Flight (RTF) support teams at Wallops, the testing, re-qualifying and training events will ensure the team is ready to support the real life RTF mission in May 2005.

In its first mission to WFF, the NASA Shuttle Training Aircraft (STA) conducted flybys (see photo) during a recent NASA RTF mission carrying the Portable Spacecraft Simulator (PSS). The Wallops STA/PSS test on January 28, 2005 included the Wallops site (S-band telemetry, C-band radars, and STS UHF air-to-ground system) for this RTF mission. This RTF STA/PSS test provided site-specific training on WFF STS support operations, and additionally provided proficiency training for the GN team. According to the NENS Network Operations Manager (NOM), the Wallops team did a great job in supporting the STA/PSS testing that day.

The PSS, simulating the Orbiter Discovery downlink and processing of the command uplink, was loaded on board the STA (NASA 945). The Merritt Island Launch Annex (MILA) tracking station tracked the

NASA Gulfstream Aircraft, STA (NASA 945) departing Wallops

continued on page 18

Wallops (from page 17)

STA along the East coast until it was out of MILA's range. Wallops picked up the STA as it entered the restricted Wallops R-6604 area. Mission time on the TDRS spacecraft (TDRS spare) was scheduled so that Wallops could hand up and down to TDRS as required.

In a pre-defined pattern, the STA was flown and Wallops tracked the aircraft. Goddard personnel were on-hand to inject simulated anomalies into the test including exciter failures, loss of the Wallops Front End Processor (WFEP), PSS corrupted downlink, and TDRS failures where Wallops had to bring up their uplink command equipment.

Wallops personnel responded well to each anomaly. Not only did they resolve each of the anomalies, they also made the right call on the voice loop to GSFC NOMs and the JSC Mission Control Center. There were other representatives from Goddard/Greenbelt that were on hand to certify the Wallops personnel. All were pleased with how the Wallops team performed during the test. Kudos to all of those who supported this STA/PSS mission.

The Goddard Network Director recently requested inclusion of Wallops in future STA testing. The next planned STA/PSS test was scheduled for March 18, 2005 at Wallops.

For the latest information on NASA's Return to Flight efforts, please visit: http://www.nasa.gov/returntoflight

Lead personnel supporting this WFF RTF mission:

Melvin K. Calhoun – *NENS Network Operations Manager*
Dawna Marr – *Code 840 Project Manager*
Bruno Schonbrunner – *NENS Lead coordinator*
Steve Leslie – *GSFC Shuttle S-Band Simulator Operator*
Lee Wingfield – *Project photographer*
Red Salyers & Jim Barnes – *Air Traffic Controllers*
WFF Crash Fire and Rescue crews

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453

GN Independent Assessment Review

The Ground Network Independent Assessment Review (IAR) was conducted at Wallops Flight Facility in November 2004. A Charter was developed and Panel members were selected from other NASA facilities, United States government agencies and a Federally Funded Research and Development Center. The panel members were chartered to assess the Ground Network Project's current assets and services which are provided to a diverse set of customers. Several of these customers include other NASA projects such as Aqua, Aura and Terra; other government facilities such as the National Oceanic and Atmospheric Administration; commercial organizations; and some international partners from France, Germany, and Italy's Space agencies. The Ground Network (GN) provides a wide range of services including telemetry, commanding, tracking, Range Control, meteorological, optical and video functions. The current Ground Network consists of 25 ground station antennas, 17 unique antenna systems, six geographic antenna locations and three different owner/operator models.

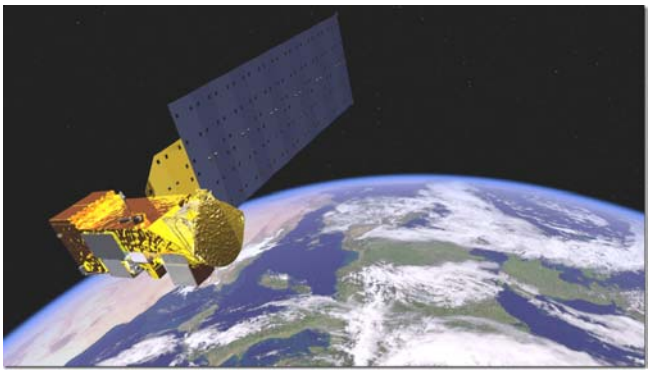
The Ground Network provides space communication services with NASA's near Earth orbiting spacecraft and is comprised of tracking stations located at Wallops Island, Virginia; Merritt Island, Florida; Poker Flat and Fairbanks, Alaska; Svalbard, Norway; Santiago, Chile; and McMurdo Station, Antarctica. This network is designed to provide communications for many of NASA's high data rate Earth Science missions (e.g. Aqua, Aura and Terra) and near Earth Space Science missions (e.g., RHESSI, Gravity Probe-B). The GN provides prime support to about 40% of NASA's earth-orbiting spacecraft and contingency support to another 34%.

Wallops Island and Research Range

continued on page 19

GN Assessment (from page 18)

Wallops Flight Facility's Research Range is a unique national resource enabling flexible, low-cost space access, aerospace-based science and technology research. It is the only launch range that NASA owns. It was established in 1945 and has provided tracking and data operations for programs such as Mercury, Gemini and Apollo. Wallops Research Range consists of three land areas, one is Wallops' main base which houses administrative and technical offices. Additionally, there are tracking and data acquisition facilities, the Range Control Center, storage/processing, research and development processing facilities, the Research Range airport which compliments the Range by providing flexible and essential air services and support for logistics, air surveillance, and Range Access. The second land area is Wallops Island which consists of launch sites, block houses, FPQ-6 radar, several camera stations, a transmitter site, processing facilities and a Dynamic Spin Balance facility. The final land area is Wallops Mainland which has tracking and data acquisition facilities. The Research Range provides communication services, among other functions, for suborbital science missions and those expendable launch vehicles which utilize the Wallops Flight Facility.



Aqua spacecraft Illustration

Some of the activities that the Research Range supports include Mission Science (Space and Earth), Aeronautics, Mission Operations, Exploration and Planetary Systems, Education, and Outreach. The Wallops Research Range is highly mobile and utilizes its mobility to support suborbital and orbital missions worldwide. Typical missions include Equatorial and Polar Sounding Rocket Campaigns, remote Expendable Launch Vehicle (ELV) supports, and down-range deployments of total or partial Range infrastructure.

Range projects integrate team members to meet, often first-of-kind, launch services requirements for science, vehicle, or technology flight projects. Some of the NASA/Wallops research carriers include the sounding rockets, scientific aircraft, scientific balloons and unpiloted aerial vehicles.

The Ground Network's Orbital Services are integral to NASA's science objectives – giving delivery of mission data to the science community. The dynamics of the Earth's interior are understood through consistent, long-term observations which are possible with the use of the facilities located within the Ground Network.

One of the guest IAR presenters included Dr. Claire Parkinson from Goddard Space Flight Center's Observational Science Branch, who gave a presentation entitled "Science Made Possible by the Ground Network: The Aqua Example." This presentation included the key goals of the Aqua mission and many pictures and graphs which have been taken from the Aqua, Aura and Terra spacecrafts. Some of these photographs included the Oregon fires in August 2002 and Hurricane Isabel in September 2003. Dr. Parkinson's presentation also included elements of the Earth's water cycle (snow and ice) as well as the sea temperatures which are monitored by the Aqua spacecraft. All of this gathering of Earth's weather-related data is made possible through the use of the ground stations located at Alaska and Norway. Another presentation was given by Dr. Miguel Larsen from Clemson University whose presentation gave another customer's perspective of the suborbital services provided by the GN, specifically the sounding rockets and the many science experiments that are performed with the help of the Ground Network facilities.

Finally, as part of the Ground Network, the Merritt Island (MILA) and Ponce de Leon (PDL) tracking stations and their specific functions were discussed. For a description of the MILA and PDL facilities, see the article entitled "*Ground Network Prepares for NASA Return to Flight*" in this issue.

The two and one-half days of diverse presentations gave the panel members much needed insight into what the Ground Network is trying to accomplish now and in future operations. A final assessment and report will be given to the Ground Network Project Team.

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Ground Network Prepares for NASA Return to Flight

Two Near Earth Network Services (NENS) Ground Network sites are at the forefront to support NASA's Return to Flight (RTF) activities: the Merritt Island Launch Annex (MILA) in Florida and the Wallops Flight Facility (WFF) in Virginia.

MILA Activities

The Merritt Island Launch Annex tracking station (see photo) was established by NASA's Goddard Space Flight Center as one of the 17 Manned Space Flight Network ground stations to provide earth orbital support to the Apollo program in 1966. Since STS-1, MILA has supported every Shuttle launch. The Ponce De Leon (PDL) tracking station was constructed in 1979 at New Smyrna Beach in order to provide S-band communications with the Space Shuttle when MILA's signal is blocked by the solid rocket booster plume.

As NASA prepares for RTF of the Space Shuttle, the MILA and PDL Ground Network stations in Florida have been at the forefront of preparations. Station personnel have been working many long hours on a variety of tasks to ensure the stations are ready to support. New hardware has been installed including upgraded data receivers, external tank TV systems equipment, a Shuttle antenna monitoring system, a UPS system at PDL, simulators, and data monitoring equipment to name a few. Correction of software discrepancies continues to be an area of focus. In the last year, over 250 software discrepancies were corrected with only 57 remaining open today, and all discrepancies that were deemed RTF issues have been corrected.

Merritt Island Launch Annex (MILA) tracking station

Facilities personnel have been supporting the NENS Depot Level Maintenance (DLM) team and have completed refurbishment of both 9-Meter antennas (see photo) and both UHF antennas.

MILA 9-meter #2 Antenna

Refurbishment of the 140-foot tower and 3-Meter User antenna (see photo) was complete in February 2005. This has been an extraordinary effort over the last two years, with the DLM and supporting personnel working 60-hour weeks for months at a time. This major accomplishment has resulted in the MILA antennas being in excellent condition for RTF support.

Recertification of personnel and the station antennas began in October 2004 and continues today. A recent special visit by the crew of NASA's RTF Space Shuttle mission (STS-114) was enjoyed by MILA personnel. The station has supported over 44 simulations and engineering tests, including launch, landing, on orbit, network, range safety, and other simulations involving not only the Ground and Space Networks, but also Kennedy Space Center, Johnson Space Center, and Marshall Space Flight Center.

continued on page 21

GN Prepares (from page 20)

3 Meter User Antenna takedown from 140 Foot Tower

We recently supported four days of successful Shuttle Training Aircraft (STA) flybys where approximately eighty failures were induced to test operators on contingency procedures. All MILA and PDL antennas were recertified for Shuttle support during the flybys, and personnel re-certifications are targeted for completion by early April. With launch only 3 months away, additional simulations, testing, and flybys will ensure the stations and personnel are ready.

WFF Activities

The WFF site is also one of the Manned Space Flight Network ground stations to provide earth orbital support to the NASA Shuttle program. The NENS Wallops Shuttle Support Team continues to re-qualify the WFF GN systems to support RTF.

WFF range and orbital systems being tested include S-band telemetry and C-band radars, STS UHF Air-to-Ground voice, and, of course, the personnel manning the systems. As the RTF Space Shuttle mission (STS-114) gets closer, WFF personnel are also participating in STS in-house system readiness testing, launch simulations, and Air-to-Ground launch simulations.

WFF is working long, hard hours testing with two types of dynamic simulations: the Portable Spacecraft Simulator (PSS) and the STA. Passive testing includes STS data flows and engineering tests, including launch, landing, on orbit, network, range safety, and other simulations with the Manned Space Flight Network.

A recent special visit by the record holding Astronaut Jerry Ross really pumped up the NENS Wallops Shuttle Support Team. Ross visited Wallops on January 31, 2005 to meet with the Wallops Shuttle Support Team as NASA prepares for RTF Space Shuttle mission (STS-114) activities. Ross spoke to several personnel on the Wallops team in the Orbital Tracking Station (see photo) that will support manned spaceflight launches scheduled later this year. He gave an emotional, rousing, and sometime humorous talk about re-focusing our efforts to support manned spaceflight.

continued on page 22

(l-r on floor) *Randy Hopkins, Alex Lawson, Michelle Williams, Tonya Young, JT Custis*

(l-r standing) *Ken Griffin, Matthew Schneider, Michael Wells, Jim Bogan, Bob Ross, Angie Wingfield, Daniel Rothwell, Astronaut Jerry Ross, Jim Bangerter, Jim Evans, Tom Singer, Gene Ward, Bill Dize, Bill Wallace, Ronnie Thomas, J.R. Hendrickson, Jamie Parks, Michael Sosebee, Jody Sutton, Jim Russell, Mark Harris, and Bruno Schonbrunner*

Photo: Lee Wingfield/LJT

Astronaut Jerry Ross visits with the NENS Wallops Shuttle Support Team

GN prepares (from page 21)

Ross received his bachelor of science and master of science degrees in Mechanical Engineering from Purdue University in 1970 and 1972, respectively. He was selected as an astronaut in May 1980. Among personal milestones, he became the first human to be launched into space seven times, and Ross holds the current United States records for spacewalks (nine) and spacewalking time (58 hours and 18 minutes).

Jerry Ross currently serves as Chief, Vehicle Integration Test Office at Johnson Space Center and is the Chief Astronaut, NASA Engineering and Safety Center (NESC).

For the latest information on NASA's Return to Flight efforts, please visit the following URL:
http://www.nasa.gov/returntoflight

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PDL Working in Harmony with Nature

HTSI NENS operations in Florida found a way to work in harmony with nature recently when replacing a collimation pole at the Ponce DeLeon (PDL) site. The 60-foot wood pole that holds the feed horn for the 4.3-meter antenna was very old and worn, and needed replacement. Merritt Island Launch Annex (MILA) Facilities Supervisor, HTSI employee Kevin King, researched the requirements for a replacement concrete pole, and, with the assistance of Craig Timmins from HTSI's Purchasing Department, located a vendor for installation. Due to PDL's location and the size of the new pole, it was necessary for King to coordinate with the U.S. Coast Guard for access to their facility to bring the new pole to the PDL Station, and also with Florida's Volusia County Leisure Services Department because the pole is located adjacent to the Smyrna Dunes Park, an environmentally sensitive area.

When King made contact with Smyrna Dunes Park Manager Joe Haas, the park manager asked that NASA consider placing an osprey nesting platform on the new pole at PDL. Haas related that an osprey feeds daily on the existing pole, and that the Audubon Society already requested that a platform be placed on the pole for approximately one year.

The platform issue was presented to NENS management and the NASA Station Director, Gary Morse, for consideration. Due to the sensitivity of the osprey when nesting, and the possible interference during any antenna maintenance activities, HTSI and NASA manage-

Replacement Collimation Pole

continued on page 23

PDL (from page 22)

ment proposed that the old pole be donated to the park instead of having a nesting platform installed on the new pole. King then contacted the installation contractor to ensure there were no plans to keep the old pole, and then presented the alternate option to Park Manager Haas. Haas was very pleased with the new alternative, and was eager to receive the old pole. In addition, Haas was put in touch with the installation contractor to determine if they could install the pole at the park while they were onsite to install the new pole at PDL. After a meeting between the two parties, it was agreed that installation of the old pole at Smyrna Dunes Park would take place once installation of the new pole at PDL was completed.

In preparation for receiving the pole, the park staff built a nesting platform. The reutilization and installation of the pole was performed at no cost to the park other than the cost to build the platform. The installation contractor donated labor and materials, and NASA donated the pole, so it was a win-win for all parties involved, even the feathered ones.

Ponce De Leon (PDL) Tracking Station

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The McMurdo 2005 Summer Ends

The summer on the ice has come and gone. The last flight, dubbed Flight 10, departed McMurdo, Antarctica on February 26, which is also the day that winter began there. Our Space Technology-5 and Joint Spacecraft Operations Center (JSOC) work team has done a lot of important work in McMurdo during this short summer season.

The five members of the antenna team left the ice on February 4, 2005, and the remaining three persons departed on February 14, 2005. They were not alone, since the supporting team members stayed behind. They include the Administration, Operations, Logistics, Security testing and engineering teams from Wallops; ViaSat Engineers; and Enertec from Virginia and France.

A major area of concern that presented a risk at the start was the project schedule. The timeline depended on everything going as planned. Very wisely the schedule had some slack time built in with normal work days and weekends off. As luck would have it, this slack time was quickly used up when the weather got bad and engine trouble developed. The planes from Christchurch, New Zealand to McMurdo stopped flying. Our team was on the first C-141 flight that went halfway and turned around due to bad weather at the McMurdo runway. After that, the team would get up very early each morning (around 4 am) to get ready to fly. They had to check out of the hotel, store their extra baggage, and ride to the airport, only to learn that the flight for that day had been cancelled. Some days they got lucky: they were notified the night before that they would not attempt to fly the next day, so they got to sleep in a little longer. This routine continued for 13 days until four people were finally able to fly in. The remaining three arrived at McMurdo on the 18th of January.

The work of moving the JSOC had already begun. It was coordinated remotely via phone and email by Mr. Hess and the two on-site personnel. By the time the ST-5 and move team arrived, all the equipment had been moved from the Crary lab into the JSOC building. A new schedule and a request for an extension was requested and granted upon arrival.

Work began right away on the antenna. After taking the baseline measurements and getting all the gear ready, the feed was gently removed. That was not too difficult, and installation of the sub-reflector began next. Again, removing it was easy, but the alignment and focus were a little tougher. The issues were cleared up and the hardware upgrade

continued on page 24

McMurdo Summer (from page 23)

Pictured above, left to right are: Evan Webb/NASA-ST-5 Systems Engineer, Ed Payne/HTSI Software, Jeff Smith/ViaSat Antenna Engineer, Mike Condon/Hammers Engineer, Alex Cunningham/HTSI-MGS Ops, Nick Sinkola/HTSI- MGS Ops, Scott Underwood/LJT Engineer, Henry Dewitt/ Dewitt and Associates, Binh Phan/ViaSat Engineer, and David Hess/ HTSI Engineer and team leader.

GSFC team at McMurdo

work was successfully completed on February 1, 2005. Final bore sight testing and tracking with various on-orbit spacecraft completed the acceptance testing. The antenna team came home. They flew on the last C-141 flight that serviced McMurdo. A C-17 will replace the C-141 from now on.

The work-to-be-done focus now shifted to the software fine tuning and remaining hardware interfacing in the JSOC. The three remaining engineers, along with the two 'wintering over' personnel, continued to work in the JSOC doing testing, correcting interface problems, and working on cable dressing and labeling. Each configuration and operational process for all the existing missions was configured and tested. The new missions that will be supported after the JSOC is operational are: Minotaur launch, DART, ENVISAT, ERS-2 GOME, and of course ST-5. A security scan was conducted and issues were corrected. Each day a teleconference was held with the GSFC and Wallops team while sitting on the floor in a 50-degree building. Only one telephone is available until the Intercom system arrives and becomes operational.

As of this writing, the engineers have finished the acceptance testing and gathering of documentation data for updating of the documents. The certification testing started but additional testing remains to be done and will be conducted by the remaining 'wintering over' crew. So far, certifications have been completed and normal operations have resumed for TRACE, Grace-1 and Grace-2. Data tapes of RADARSAT-1 have been made of and shipped for analysis.

The work continues. The remaining testing was completed by the end of February with a return to operations on the 1st of March.

The departing remaining team members left a list of work to be done for the 'winter over crew'. There were problems still to be corrected and interfaces to test. The 'winter over' crew felt confident that they could handle any problem that might come up. Plans were made to handle any remaining problems. Any required software changes can be done by FTP of software files. Hardware replacement problems that might crop up will have to wait until Win-fly in August 2005.

During the planning phase, this project was risky and some commented that this was a "pig in a poke". The positive bunch replied that it could be done and everything would turn out okay. During the effort, one comment from McMurdo was that it was "funny". I never got a good answer on what that meant. I figured it was a fun adventure. But what do I know is that I did not get to go. As it turned out, the weather finally got better and warmer and some of the ice melted. The work was accomplished and we have yet to see if ST-5 support goes well. Because of the great effort and the talented and dedicated Managers, Engineers, and supporting willing workers, we hope that the final chapter will be successful. Once again NASA and the contractor team have shown that almost anything is possible, even if it is 30 degrees Fahrenheit outside and 50 degrees inside in the summer time.

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MILA/PDL Station Director Transition

After 40 years of Federal Government Service, Tony Ippolito, MILA Station Director, is retiring at the end of March and will be succeeded in that capacity by Gary Morse. Tony started his career teaching in Malaysia with the Peace Corps. After four years of service there, Tony accepted a job with NASA, at Kennedy Space Center, as an engineer in the Communication and RF Systems Branch. Goddard was fortunate enough to coax Tony into service as the Deputy MILA Station Director in 1988 and he became MILA Station Director shortly thereafter. Throughout his career, Tony has been admired not only for his technical and management abilities but also his integrity and compassion. It has been my personal good fortune to work with Tony over the past three years and we'll miss him.

Gary Morse and Tony Ippolito

We're very happy that Gary Morse has agreed to take the reins at MILA. Most of us know Gary from his years of service here at Goddard as Network Director and his work at Johnson Space Center with SOMO. Gary's unique knowledge on manned space flight tracking and communications requirements and his fundamentally sound management approach make him ideal for this critical position. Please join me in welcoming Gary back into the Space Communications Program team.

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MLCD Opens New Project Suite

The Mars Laser Communications Demonstration (MLCD) Project held an Open House on December 12, 2004 to welcome everyone to their new suite of offices, located in Building 12, Room E234. Rick Fitzgerald, MLCD Project Manager, cut the ribbon to officially open the suite for business. The MLCD staff had a delicious array of goodies for everyone to nibble on as they admired the new suite. The ribbon-cutting culminated over 10 months of work, with MLCD staff scattered over Building 12. Karen Jackson/PAAC-II, Resources Analyst for MLCD, and LaureyAdkison, Financial Manager for MLCD, worked hard to coordinate all the work and were rewarded by having a beautiful new suite, with a much-needed kitchen and ample room for expected growth of the Project. Congratulations to the MLCD Project on their new offices.

Rick Fitzgerald performing the honor

March 4, 2005
Space Communications Program Team,

It is with great pleasure that I announce that Bob Jenkens will take over project management of the MARS Laser Communications Demonstration (MLCD) effective March 6, replacing Rick Fitzgerald who is leaving Government service for a position in industry. Bob has great talent and experience to bring to the challenging MLCD mission and has already started working with the MLCD team to ensure a smooth transition when Rick goes into a leave status on March 5. Please join me in welcoming Bob to his new assignment. I know I can count on you to give him your full support. I wish to add my thanks to Bob for his outstanding leadership of the TDRS team over the past 4 years.

I would like to congratulate and thank Rick for the great leadership he provided to bring the MLCD from the end of the concept study to PDR. It has been a fast paced year and three quarters full of technology and leadership challenges. Rick has formed a strong team which I am confident will continue on effectively under Bob's leadership to mission success. Please join me in thanking Rick for his substantial efforts and talents which have contributed so much to bringing this revolutionary technology closer to reality. He leaves the mission in great shape (very evident from the PDR this week at MIT) ready to move on to confirmation, development and operations. I would also like to add my personnel best wishes for your future success.

I also take great pride in announcing that Ed Lowe will be acting project manager of the TDRS Project effective March 6. Ed has tremendous management experience from his work at GSFC and Headquarters and did an outstanding job in managing the TDRS H,I,J ground segment development and most recently as TDRS Project Deputy Project Manager. Bob and Ed have built a strong TDRS team which I am certain will continue to effectively meet the Space Network's TDRS development and sustaining needs. Please join me in welcoming Ed to his new responsibilities. I know you will provide him your full support for the critically important efforts to continue this National Resource into the future.

Congratulations and thanks to all,

Phil Liebrecht
Associate Director of Flight Programs & Projects
Directorate for Space Communications

SCP People & Announcements

Awards and Acknowledgments

Congratulations to Kevin McCarthy on being named NASA COTR of the Year! This was a NASA-wide award. Kevin is the NENS COTR.

Mr. Todd Probert/NENS received the Quality and Process Improvement Award on behalf of the White Sands Complex Chiller Plant Team. The award was presented at the 2004 Annual Awards of Excellence Ceremony on October 6, 2004.

Mr. Ken Griffin/WFF received the Customer Service Excellence Award on behalf of the Alaska Wildfire Response & Recovery Team. The award was presented at the 2004 Annual Awards of Excellence Ceremony on October 6, 2004.

The SN Project received kudos from the Air Force's Lt. Col. Skotte, DMSP Satellite Systems Division Chief, for its recent DMSP support: "It really was a monumental effort from many individuals representing many organizations, scattered far and wide. A great team effort!!!!!!"

Farewell to Dennis

About one year ago, after nearly 24 years being associated with the Space Communications Program, Dennis VanderTuig accepted a detail to work on the Integrated Financial Management Program (IFMP) as the GSFC Budget Formulation (BF) Implementation Project Manager. A few months ago, after Mark Walther (the IFM Program Manager) accepted a detail at another Center, Dennis was named to act in Mark's position. Shortly thereafter, Dennis was permanently reassigned to the IFM Program making his departure from the Space Communications Program "official". Everyone on the Program misses Dennis. In addition to being a pleasure to work with, he made significant contributions to the Program over the years. For example, after first joining the Center in 1980 as a

logistics management specialist, Dennis helped to plan and develop the logistics systems for the ground stations of the Tracking and Data Relay System (now known as the Space Network). Dennis later served as the Contracting Officer's Technical Representative for the Mission Operations and Data Systems comprehensive logistics support contract. He also served as the Head of the Networks Division's Business Management Branch prior to becoming the Program Business Manager in 1998. A little known fact about Dennis is that prior to joining Goddard, he had a job in the Peace Corps developing and managing cultural resource preservation programs in Micronesia. While he was out in the Pacific, he served as the first Historic Preservation Officer of the Commonwealth of the Northern Mariana Islands and established the Commonwealth's first arts agency. It is clear that Dennis is continuing his tradition of outstanding performance in his new role and we wish him well on IFM and beyond.

The Space Communications Program extends its sympathy to the family and friends of Mark Pepin of Honeywell Technical Services Inc. Mark passed away on February 22.

SCP People & Announcements

Welcome

The Mars Laser Communications Demonstration Project welcomes John Baniszewski. John comes to Code 455 with a wealth of experience. He has been at GSFC since 1978 and has worked with NIMBUS-7, Landsat 4 and 5, HST, TDRS Project, EOS Project, TRMM, POES and GOES, and the SEU/NMP Program.

The Space Network Project welcomes Ron Miller as the Deputy Project Manager. Ron has been at GSFC for 13 years, spending the first seven of those on the TDRSS Project. More recently, he has served as Observatory Manager on the LDCM project, Project Formulation Manager for the Global Tropospheric Winds Sounder mission, and Mission Integration Manager for the Rapid Spacecraft Development Office.

The proposed Space Network Expansion (SNE) Project welcomes Pam Harris. Pam will provide administrative support for both the SNE and the Customer Commitment Office.

The SNE also welcomes Michelle Renaud. Michelle is the Financial Manager for the proposed project. Michelle has been at Goddard for 19 years and came to SNE from the GPM Project.

The PAAC-II office welcomes two new employees. Neil Dissinger (on left) will be the Configuration Manager for the Space Network. Warren Shultzaberger (on right) will be the Configuration Manager for the proposed Space Network Expansion Project.

SCP People & Announcements

SCP Holiday Party

SCP held its annual Holiday Party on December 16. Over 100 attendees enjoyed delicious food from Red, Hot, and Blue. In addition, program employees generously donated oodles of yummy desserts for the delectation of party guests. SCP managers served the food and were very festive in their reindeer ears. Many thanks to Joan Walton and the whole Holiday Party committee for their hard work in making the festivities such a resounding success.

Meet and Greet for Harold Brockelsby

On February 16, the Space Network put on a delicious pizza party to welcome Harold Brockelsby, the new White Sands Station Director. It was a great opportunity to meet and welcome Harold to the SCP family.

Keiji Tasaki & Harold Brockelsby

Congratulations to Keiji Tasaki, Space Network Project Manager, on the birth of his third grandchild. SCP welcomes Maya Grace Bomhardt who arrived on January 12, 2005 weighing 7lbs, 1oz, and measuring 20 inches long. Keiji describes his very hectic January 12.

"January 12 was a hectic day for everyone. Our daughter, Zozscha, went to Howard County General at around 12 a.m. My wife and I received a call around 1:30 a.m. We were at the hospital at 2:30 a.m. Maya was born at around 3:30 a.m. We saw her at 4:30 a.m. We left the hospital and were home by 6:30 a.m., which was our usual breakfast time. After breakfast, I was at work at the usual time, left for the airport around noon, caught a plane to El Paso, and was in Las Cruces, New Mexico by 7:30 p.m. It was a memorable day. We have two other grandchildren, and will have another one by this June. I feel old."

Farewell to Joanne

We bid a fond farewell to Joanne Lodowski of the TDRS Project. Joanne is retiring after 30 years of service to NASA; most of it at Headquarters. She is relocating to Myrtle Beach, South Carolina. We speed her on her way with warm wishes for a happy retirement!

It is with great sadness and regret that we learned of the passing of Paul Heffernan. Paul supported Code 454, the TDRS Project. He joined NASA in the 60's and made substantial and significant contributions to many space missions over the years. Paul was also a passionate musician and brought joy to many. We extend our deepest sympathy to Paul's family.

The ***Space Communicator*** is located on the SCP website at
http://scp.gsfc.nasa.gov/communicator

Previous issues of this publication, formerly named *The Integrator*, are also available online in the newsletter archive.

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